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## Health Disparities in Police Officers: Comparisons to the U.S. General Population

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### Abstract

Police officers have one of the poorest cardiovascular disease (CVD) health profiles of any occupation. The goal of this study was to determine if police officers in the Buffalo Cardio-Metabolic Occupational Police Stress (BCOPS) Study (between 2004 and 2009) had a more adverse CV profile than the general U.S. employed population. Nearly one-half (46.9%) of the officers worked a non-day shift compared to 9% of U.S. workers. The percent of officers with depression was nearly double (12.0% vs. 6.8%) and officers were nearly four times more likely to sleep less than six hours in a 24-hour period than the general population (33.0% vs. 8.0%). A higher percentage of officers were obese (40.5% vs. 32.1%), had the metabolic syndrome (26.7% vs. 18.7%), and had higher mean serum total cholesterol levels (200.8 mg/dL vs. 193.2 mg/dL) than the comparison employed populations. In addition to having higher levels of traditional CVD risk factors, police officers had higher levels of non-traditional CVD risk factors. These findings highlight the need for expanding the definition of a health disparity to include occupation. Future studies should expand this comparison to additional traditional and non-traditional CVD risk factors and to other occupational groups.

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## Keywords

law enforcement; cardiovascular disease; risk factors; health disparity; epidemiology

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In the United States, cardiovascular disease (CVD) mortality declined considerably (by 65%) from 1968 to 2006, yet heart disease remains the leading cause of death for adults (National Heart, Lung, and Blood Institute [NHLBI], 2009). Consistent with this, the prevalence of key CVD risk factors (e.g. obesity, high blood pressure, high cholesterol, and diabetes) have also decreased over time but in more recent years these trends have leveled off or actually reversed (Gregg et al., 2005). These recent trends can have important implications for the workplace, as heart disease is the third leading activity-limiting chronic condition behind arthritis and back and neck conditions (NHLBI, 2009).

Policing is an occupation that requires unpredictable and stressful bursts of intense and strenuous physical activity, placing high demand on the cardiovascular system (Kales, Tsismenakis, Zhang & Soteriades, 2009). In an earlier study, Vena and colleagues (1986) found that white male police officers died on average seven years earlier than the general U.S. white male population (Arias, 2010). This finding led to numerous subsequent studies to identify specific risk factors and conditions for this disparity. Police officers exhibit some of the poorest CVD health profiles of any occupation, including higher rates of CVD risk factors (Franke, Ramey & Shelley, 2002; Ramey, Downing, & Franke, 2009; Hartley et al., 2011; Ramey, Perkhounkova, Downing & Culp, 2011; Wright, Barbosa-Leiker, & Hoekstra, 2011), overt CVD (Franke et al., 2002; Ramey et al., 2009), and on-duty CVD events (Kales et al., 2009).

Compounding this issue is the well-known fact that police officers experience high levels of job-related stress, frequently attributed to shift work, the potential for witnessing or experiencing violent events, and organizational pressure (Chen et al., 2006; Franke et al. 2002; Gershon, Lin & Li, 2002; Kales et al., 2009). The effects of job stress are well studied and include increased levels of psychological disorders such as anxiety, depression, and post-traumatic stress disorder (Gershon et al., 2002), and physiological conditions including hypertension (Franke et al., 2002; Ramey, 2003), and CVD (Backe, Seidler, Latza, Rossnagel & Schumann, 2011).

A health disparity is a “chain of events signified by a difference in environment, access to, utilization of, and quality of care, health status or a particular health outcome that deserves scrutiny” (Carter-Pokras & Baquet, 2002, p. 427). Health disparities are generally thought of as existing in differing groups, such as racial/ethnic groups, between men and women, or within social classes. However, health disparities may also exist in groups that are strongly influenced by the context of their occupation. This paper compares data on health disparities between participants in an epidemiologic study of police officers from a large Northeastern city with similar estimates from large epidemiologic population-based studies of primarily U.S. employed adults. The goal of this analysis is to determine if this cohort of police officers has a more adverse cardiovascular profile than the general U.S. employed population.

## METHOD

### Study Population

Data for the police officers came from the Buffalo Cardio-Metabolic Occupational Police Stress (BCOPS) Study conducted between 2004 and 2009. The overall objective of this cross-sectional study was to examine the association between psychological stress and subclinical CVD among 464 police officers. Each reported value for the variables of interest are taken or derived from findings in published manuscripts from the BCOPS Study (Hartley et al., 2011; Ma et al., 2011; Hartley et al., 2012; Slaven et al., 2012). All four studies excluded from the analyses 33 retired police officers who participated in the BCOPS Study.

Values for each of the variables of interest were obtained from peer-reviewed publications or from data available in U.S. Government reports or Web sites. Data for the general population estimates are primarily from large epidemiological studies of U.S. adults, including the U.S. Centers for Disease Control and Prevention's National Health and Nutrition Examination Survey (NHANES) and the National Health Interview Survey (NHIS), the U.S. Bureau for Labor Statistics' Current Population Survey (CPS), and the Multi-Ethnic Study of Atherosclerosis (MESA). For most of these study populations it was possible to restrict the comparison to employed adults (McMenamin, 2007; Davila et al., 2010; U.S. Bureau for Labor Statistics, 2011; Fujishiro et al., 2011). The estimates for depression and glucose intolerance are from U.S. adult populations not restricted by employment status (Ervin, 2009; U.S. Centers for Disease Control and Prevention, 2011). Table 1 describes these comparison studies and study populations by variable of interest.

### Study Measures

**Demographics**—Sex and ethnicity were obtained from a self-reported demographics questionnaire for the BCOPS Study (Hartley et al., 2011) and from the 2010 U.S. Bureau for Labor Statistics Current Population Survey for the general U.S. employed population (U.S. Census Bureau, 2006). The percent of women in each study is reported with the corresponding variable of interest. The mean age of the participants in each study is also reported. Fujishiro and colleagues (2011) reported the mean age using data from employed participants in the MESA Study. For the remaining studies, age was reported by categories and the mean age for these studies was calculated using a weighted average. An upper age limit of 85 was assumed for data from the NHIS and NHANES except for Ervin (2009) where 59 was the upper limit. The upper age limit of 75 was assumed for data from the Current Population Survey.

**Shift Type**—For the BCOPS Study participants, daily payroll records were obtained from 1994 to date of examination (between 2004 and 2009) and used to calculate the shift most frequently worked (day, afternoon, midnight). A detailed description of the methods used to determine the most frequently worked shift has been reported (Ma et al., 2011). Shift type was determined for the employed comparison population using questions from the 2004 U.S. Bureau for Labor Statistics' Current Population Survey (McMenamin, 2007) as this was the most recent year available.

**Psychosocial Measures**—Depressive symptoms were measured in the BCOPS Study using the Center for Epidemiologic Studies--Depression (CES-D) Scale. Details of the CES-D are reported (Radloff, 1977, Slaven, et al., 2012). For this study, a cutoff score of 16 or higher was used to identify officers with depression (Radloff, 1977). For the comparison population, depressive symptoms were measured using the Patient Health Questionnaire-9 (PHQ-9) (CDC, 2011) and for this study a cutoff score of 10 or greater was used to identify participants with depression (Kroenke, Spitzer, & Williams, 2001).

**Lifestyle Behaviors**—For both groups, smoking status was derived from self-reported questionnaires and participants were classified as never smokers, former smokers, or current smokers. Hours of sleep was defined for the BCOPS Study participants using the Pittsburgh Sleep Quality Index (PSQI) question “During the past month, how many hours of actual sleep did you get at night?” (Slaven et al., 2012). For the comparison population, participants responded to the question “On average, how many hours of sleep do you get in a 24-hour period?” (Luckhaupt, Tak, & Calvert, 2010).

**Cardiometabolic Risk Factors**—Cardiometabolic risk factors (i.e. body mass index, total serum cholesterol, blood pressure, glucose intolerance, metabolic syndrome, common carotid intima media thickness) were obtained using the same procedures for the BCOPS Study participants (Hartley et al., 2011; Hartley et al., 2012) and the comparison participants (Ervin, 2009; Davila et al., 2010; Fujishiro et al., 2011). Body mass index (BMI) was used to define the percent of participants who were overweight or obese; a BMI between 25 and 29.9 kg/m<sup>2</sup> is considered overweight and a BMI of 30 kg/m<sup>2</sup> or greater is considered obese. Total serum cholesterol levels (mg/dL) were obtained from a 12-hour fasting blood sample. Resting systolic blood pressure was measured three times with a standard sphygmomanometer and reported values are the average of the second and third readings. Glucose intolerance was defined as a fasting serum glucose level of 100 mg/dL or greater, or self-reported diabetes and taking hypoglycemic medication.

The metabolic syndrome (MetSyn) was defined using the modified version of the 2001 Third Report of the National Cholesterol Education Program Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Grundy et al., 2005). MetSyn was considered present in individuals with 3 or more of the following components: hypertension, reduced high density lipoprotein cholesterol, abdominal obesity, glucose intolerance or hypertriglyceridemia.

Common carotid intima media thickness (IMT) measurements were obtained via ultrasound scans using standardized protocols. Details of the scan have been previously reported (Fujishiro et al., 2011; Hartley et al., 2011). Briefly, standardized longitudinal images were acquired of the near and far walls of the distal 10 mm portion of the common carotid artery (CCA) on both the right and left sides.

## RESULTS

The comparison between the BCOPS Study participants and the general U.S. employed population can be found in Table 2. In general, just over 25% of the BCOPS Study

participants were women (range 25.9% - 28.6%) compared to nearly 50% of the comparison study participants (range 42.4% - 50.6%). The mean age for the BCOPS Study participants across the studies was approximately 41 years (range 40.7 – 41.5). There was considerable variation in the mean age for the comparison study participants. The weighted mean age ranged from 39.5 years for the 2003 – 2006 NHANES population to 56.4 years for the employed participants of the MESA Study.

Focusing on the specific variables of interest, slightly more than one-quarter of the BCOPS Study participants were women compared to 42% of U.S. workers. Twenty percent of the officers were black compared to only 11% of U.S. workers; only 1.8% of officers were Hispanic compared to 14.3% of U.S. workers. Nearly one-half (46.9%) of the police officers worked a non-day shift compared to 9% of U.S. workers. The percent of officers with depression (police officers: CES-D 16; comparison group: PHQ-9 10) was nearly double that of the general population (12.0% vs. 6.8%).

A slightly higher percent of officers were current smokers compared to the employed population (16.7% vs. 13.6%). Police officers were four times more likely to sleep less than six hours in a 24-hour period than the employed population (33.0% vs. 8.0%). The percentage of officers who were overweight was similar to the employed population (41.5% vs. 40.0%); the percent obese was higher for the officers compared to the employed population (40.5% vs. 32.1%).

Mean serum total cholesterol levels were slightly higher for officers compared to the employed population (200.8 mg/ dL vs. 193.2 mg/dL), while systolic blood pressure levels were similar for both groups (120.9 mm Hg, 121.6 mm Hg, respectively). The percent of police officers who were glucose intolerant was lower than the general population (23.6% vs. 32.4%). However, nearly 27% of police officers had MetSyn, which includes glucose intolerance and hypertension, compared to 18.7% of the employed population. The mean common carotid intima media thickness for the police officers was 0.62 mm compared to 0.82 mm for the employed population.

## CONCLUSIONS

In the current study we compared levels of traditional and non-traditional CVD risk factors between participants in the BCOPS Study with estimates from the general U.S. employed population. Nearly three-quarters of the police officers were men compared to about 58% of U.S. workers. This discrepancy was consistent throughout each of the comparisons of the variables of interest. Policing is a male dominated occupation where women account for just over 10% of all sworn law enforcement personnel in the U.S. (National Center for Women and Policing, 2002). Ethnicity also varied between the two groups. Just over 20% of police officers were black compared to 11% of all U.S. workers. There were a very small percentage of Hispanic police officers compared to 14% of U.S. workers.

Nearly half of the police officers worked a non-day shift compared to less than 10% of the U.S. workforce. Policing is a 24-hour occupation and shift work is a necessity. However, night shift work can have considerable consequences on health and safety. Shift work has

been associated with CVD, obesity, MetSyn, diabetes, and mood and anxiety disorders, most likely as a result of circadian rhythm disruption (Shift work and sleep, 2011).

One-third of police officers reported sleeping less than six hours in a 24-hour period; this finding was four times higher than employed workers completing the National Health Interview Survey. Sleep loss can be a consequence of shift work, and has been associated with higher levels of perceived stress in male police officers and among those with higher police ranks and greater workloads (Charles et al., 2012). Chronic sleep loss can lead to excessive fatigue and impaired alertness. These outcomes can have immediate consequences for police officers as the nature of their job requires them to function in a hypervigilant state (Shift work and sleep, 2011).

The prevalence of depression was nearly twice as high for the police officers as the general population. This finding is somewhat surprising given that the comparison study sample was not restricted to employed adults, included a higher percentage of women, and possibly included a higher percentage of persons who have chronic medical conditions and those who are unemployed. Depression is known to be higher among women, those with chronic medical conditions, and those who are unemployed (Marcotte, Wilcox-Gok, & Redmon, 1999; National Institute of Mental Health; U.S. Department of Health and Human Services, 1999). However, age is also a significant risk factor for depression. According to the National Health Statistics Report (Pratt & Brody, 2008), persons between 40–59 years of age have the highest prevalence of depression compared to teens, young adults, and older adults. Roughly 60% of the BCOPS Study participants fall into this working age category (Hartley et al., 2011). Workers in this age category may also be providing child care and/or elder care in addition to their responsibilities as a police officer. And as previously indicated, policing itself is considered to be a high stress occupation (Gershon et al., 2002) and job strain and low social support at work have been significantly associated with major depressive disorder (MDD; Blackmore et al., 2007).

With regard to the cardio-metabolic risk factors, police officers had a similar percentage of participants who were overweight (BMI 25–30 kg/m<sup>2</sup>), similar levels of systolic blood pressure, and lower levels of glucose intolerance compared to the respective comparison population. Yet the prevalence of MetSyn, which includes these three risk factors in addition to hypertriglyceridemia and reduced HDL-C, was approximately 8% higher for police officers than workers in the comparison study. The MetSyn component hypertension includes three items: systolic blood pressure  $\geq$  130 mm Hg, diastolic blood pressure  $\geq$  85 mm Hg, and antihypertensive treatment. Relying solely on systolic blood pressure levels may represent an underestimation of hypertension as successful treatment for hypertension should reduce levels of systolic blood pressure. As we have reported, the MetSyn component hypertension is high among these police officers with 39% meeting at least one of the three component criteria (Hartley et al., 2011; Hartley et al., 2012).

The percentage of officers currently smoking was 3.1% higher at 16.7%, obesity was 8.4% higher at 40.5%, and the serum total cholesterol levels were approximately 7.6 mg/dL higher at 200.8 mg/dL, than the employed MESA Study participants. These values for the police officers fall well short of the U.S. Healthy People 2010 recommendations: reduction



in mean total blood cholesterol to 199 mg/dL, smoking to 12% of the population, and obesity to 15% of the population (U.S. Department of Health and Human Services, 2000). The higher values are not entirely attributable to age as the mean age of the police officers is notably 15 years younger than the employed comparison study participants. This makes these differences more striking given that obesity and total cholesterol typically increase from young adulthood to retirement age (Mizuno, Shu, Makimura & Mobbs, 2004; National Center for Health Statistics, 2009) and are often higher in women than in men regardless of ethnicity or educational level (Mensah, Mokdad, Ford, Greenlund & Croft, 2005; Wang & Beydoun, 2007). One possible explanation for these differences is that police officers spend a considerable amount of on-duty time being relatively inactive (Kales et al., 2009) and physical inactivity is a risk factor for both obesity and hypercholesterolemia (Pate et al., 1995).

Common carotid IMT values were much lower for police officers compared to the employed MESA Study participants. This finding is somewhat surprising given the difference in the percentage of women between the BCOPS Study and the MESA Study participants (25.9% vs. 46.9%, respectively). Women typically have lower carotid IMT than men (Howard et al., 1993; Hartley et al., 2011). However, the BCOPS Study participants were about 15 years younger than the MESA Study participants which may explain most of the difference between the two groups; carotid IMT increases at approximately 0.01 mm per year (Howard et al., 1993).

Previous studies have found police officers to have higher rates of CVD risk factors and CVD morbidity than other groups (Franke et al., 2002; Ramey et al., 2009; Ramey et al., 2011). In the current study, we compared police officers with reported results from studies including mostly employed adults. Our findings are consistent with those previously reported: a higher percentage of police officers were obese and had the MetSyn. In addition to these more traditional CVD risk factors, we found a higher prevalence of depression, and a higher percentage of police officers who work a non-day shift and sleep less than six hours a night compared to other employed adults. Previous research has reported that police officers are a known high stress occupational group (Collins & Gibbs, 2003) and that the stress associated with policing may predispose officers to higher rates of CVD morbidity and mortality (Franke, Collins & Hinz, 1998). Importantly, stress initiates an inflammatory process that may attribute to the CVD observed in 40% of atherosclerotic patients who lack traditional CVD risk factors (Black & Garbutt, 2002). This pathway may be supported by the findings in the current study.

This study has several noteworthy limitations. First, variables were selected based on their availability in published findings. Information on other key demographic variables, lifestyle variables, and CVD risk factors would be beneficial in providing a more comprehensive understanding of the health disparities of police officers. Second, there may be key differences in the demographic profile of the BCOPS Study participants and each of the comparison groups. The comparison groups were carefully selected based on the following criteria: 1) publication of findings in the scientific literature, 2) studies were conducted in the United States, 3) study participants were adults (18 or 20, depending upon the individual study), and 4) study participants were employed. Percentage of women and mean

age (actual or calculated from weighted averages) were reported and, where appropriate, were considered as a potential explanation for differences between the two groups. Third, CVD risk factors may differ by demographic characteristics. For example, in our previous findings, male police officers were found to have a higher prevalence of MetSyn than female police officers (Hartley et al., 2011). Yet, in the current study we were not able to stratify the analyses by key demographic characteristics, such as sex and age. Finally, several of the variables used in the comparison were derived from different measures. For example, the prevalence of depression is based on the Center for Epidemiologic Studies – Depression Scale (CES-D) for the BCOPS Study participants and from the Patient Health Questionnaire-9 (PHQ-9) for the comparison group, which may represent one potential explanation for the difference found between the two groups, although the level of agreement between the two measures has been addressed by others (Dbouk, Arguedas, & Sheikh, 2008; Milette, Hudon, Baron, Thombs & Canadian Scleroderma Research Group, 2010).

Strengths of this study include the use of clinical measurements versus self-report. Previous studies comparing police officers with the general population have relied upon self-report measures of hypertension, hypercholesterolemia and diabetes (Ramey, Downing & Knoblauch, 2008). In the current study, all six of the cardio-metabolic risk factors were obtained via standardized anthropometric and clinical protocols for both the BCOPS Study participants and the respective comparison groups, thus eliminating concerns about reporting bias.

In the current study we found that police officers have higher levels of traditional and non-traditional CVD risk factors than other employed adults. To our knowledge this is the first comparison of key CVD risk factors between a sample of police officers and the general U.S. employed population. Our findings highlight the need for expanding the scope of demographic characteristics that define a health disparity to include occupation, as this factor can contribute significantly to an individual's overall health and well-being. Future studies should reexamine this comparison with additional traditional and non-traditional CVD risk factors and should be expanded to other occupational groups.

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## REFERENCES

- Arias, E. United States life tables, 2006. (National Vital Statistics Reports, Vol. 58, No. 21). Hyattsville, MD: National Center for Health Statistics; 2010.
- Backe E, Seidler A, Latza U, Rossnagel K, Schumann B. The role of psychosocial stress at work for the development of cardiovascular diseases: A systematic review. *International Archives of Occupational and Environmental Health*. 2011 Epub ahead of print.
- Black PH, Garbutt LD. Stress, inflammation and cardiovascular disease. *Journal of Psychosomatic Research*. 2002; 52:1–23. [PubMed: 11801260]
- Blackmore ER, Stansfeld SA, Weller I, Munce S, Zagorski BM, Stewart DE. Major depressive episodes and work stress: Results from a national population survey. *American Journal of Public Health*. 2007; 97:2088–2093. [PubMed: 17901431]



- Carter-Pokras O, Baquet C. What is a “health disparity”? *Public Health Reports*. 2002; 117:426–434. [PubMed: 12500958]
- Charles LE, Slaven JE, Mnatsakanova A, Ma C, Violanti JM, Fekedulegn D, et al. Associations of perceived stress with sleep duration and sleep quality: The BCOPS Study. *International Journal of Emergency Mental Health*. 2011; 13(4):229–242. [PubMed: 22900457]
- Chen H, Chou FH, Chen M, Su S, Wang S, Feng W, et al. A survey of quality of life and depression for police officers in Kaohsiung, Taiwan. *Quality of Life Research*. 2006; 15:925–932. [PubMed: 16721651]
- Collins PA, Gibbs ACC. Stress in police officers: A study of the origins, prevalence and severity of stress-related symptoms within a county police force. *Occupational Medicine*. 2003; 53:256–264. [PubMed: 12815123]
- Davila EP, Florez H, Fleming LE, Lee DJ, Goodman E, LeBlanc WG, et al. Prevalence of the metabolic syndrome among U.S. workers. *Diabetes Care*. 2010; 33:2390–2395. [PubMed: 20585004]
- Dbouk N, Arguedas MR, Sheikh A. Assessment of the PHQ-9 as a screening tool for depression in patients with chronic hepatitis C. *Digestive Disease Science*. 2008; 53:1100–1106.
- Ervin, RB. Prevalence of metabolic syndrome among adults 20 years of age and over, by sex, age, race and ethnicity, and body mass index: United States, 2003–2006 (National Health Statistics Reports No 13). Hyattsville, MD: National Center for Health Statistics; 2009.
- Franke WD, Collins SA, Hinz PN. Cardiovascular disease morbidity in an Iowa law enforcement cohort, compared with the general Iowa population. *Journal of Occupational and Environmental Medicine*. 1998; 40:441–444. [PubMed: 9604181]
- Franke WD, Ramey SL, Shelley MC. Relationship between cardiovascular disease morbidity, risk factors, and stress in a law enforcement cohort. *Journal of Occupational and Environmental Medicine*. 2002; 44:1182–1189. [PubMed: 12500462]
- Fujishiro K, Diez Roux AV, Landsbergis P, Baron S, Barr RG, Kaufman JD, et al. Associations of occupation, job control and job demands with intima-media thickness: The Multi-Ethnic Study of Atherosclerosis (MESA). *Occupational and Environmental Medicine*. 2011; 68:319–326. [PubMed: 20935285]
- Gershon RRM, Lin S, Li X. Work stress in aging police officers. *Journal of Occupational and Environmental Medicine*. 2002; 44:160–167. [PubMed: 11851217]
- Gregg EW, Cheng J, Cadwell BL, Imperatore G, Williams DE, Flegal KM, et al. Secular trends in cardiovascular disease risk factors according to body mass index in U.S. adults. *Journal of the American Medical Association*. 2005; 293:1868–1874. [PubMed: 15840861]
- Grundy SM, Cleeman JI, Daniels SR, Donato KA, Eckel RH, Franklin BA, et al. Diagnosis and management of the metabolic syndrome. An American Heart Association/National Heart, Lung, and Blood Institute Scientific Statement. *Circulation*. 2005; 112:2735–2752. [PubMed: 16157765]
- Hartley TA, Shankar A, Fekedulegn D, Violanti JM, Andrew ME, Knox SS, Burchfiel CM. Metabolic syndrome and carotid intima media thickness in urban police officers. *Journal of Occupational and Environmental Medicine*. 2011; 53:553–561. [PubMed: 21505360]
- Hartley TA, Burchfiel CM, Fekedulegn D, Andrew ME, Knox SS, Violanti JM. Association between police officer stress and the metabolic syndrome. *International Journal of Emergency Mental Health*. 2012; 13(4):243–256. [PubMed: 22900458]
- Howard G, Sharrett AR, Heiss G, Evans GW, Chambless LE, Riley WA, Burke GL. Carotid artery intimalmedial thickness distribution in general populations as evaluated by B-mode ultrasound. ARIC Investigators. *Stroke*. 1993; 24:1297–1304. [PubMed: 8362421]
- Kales SN, Tsismenakis AJ, Zhang C, Soteriades ES. Blood pressure in firefighters, police officers, and other emergency responders. *American Journal of Hypertension*. 2009; 22:11–20. [PubMed: 18927545]
- Kroenke K, Spitzer RL, Williams JBW. The PHQ-9: Validity of a brief depression severity measures. *Journal of General Internal Medicine*. 2001; 16:606–613. [PubMed: 11556941]
- Luckhaupt SE, Tak S, Calvert GM. The prevalence of short sleep duration by industry and occupation in the National Health Interview Survey. *Sleep*. 2010; 33:149–159. [PubMed: 20175398]

- Ma C, Burchfiel CM, Fekedulegn D, Andrew ME, Charles LE, Gu JK, et al. Association of shift work with physical activity among police officers: The Buffalo Cardio-Metabolic Occupational Police Stress Study. *Journal of Occupational and Environmental Medicine*. 2011; 53:1030–1036. [PubMed: 21866054]
- Marcotte DE, Wilcox-Gok V, Redmon DP. Prevalence and patterns of major depressive disorder in the United States labor force. *Journal of Mental Health Policy and Economics*. 1999; 2:123–131. [PubMed: 11967420]
- McMenamin TM. A time to work: recent trends in shift work and flexible schedules. *Monthly Labor Review*. 2007:3–15.
- Mensah GA, Mokdad AH, Ford ES, Greenlund KJ, Croft JB. States of disparities in cardiovascular health in the United States. *Circulation*. 2005; 111:1233–1241. [PubMed: 15769763]
- Milette K, Hudson M, Baron M, Thombs BD. Canadian Scleroderma Research Group. Comparison of the PHQ-9 and CES-D depression scales in systemic sclerosis: internal consistency reliability, convergent validity and clinical correlates. *Rheumatology*. 2010; 49:789–796. [PubMed: 20100794]
- Mizuno T, Shu I, Makimura H, Mobbs C. Obesity over the life course. *Science of Aging Knowledge Environment*. 2004; 24:re4–re7. [PubMed: 15201431]
- National Center for Health Statistics. Health, United States, 2008 with Chartbook. 2009. Retrieved from <http://www.cdc.gov/nchs/data/hs/hs08.pdf>
- National Center for Women and Policing (NCWP). Equality denied: The status of women in policing: 2001. New York, NY: Columbia University; 2002.
- National Institute of Mental Health. Major depressive disorder among adults. Retrieved from [http://www.nimh.nih.gov/statistics/1MDD\\_ADULT.shtml](http://www.nimh.nih.gov/statistics/1MDD_ADULT.shtml)
- National Heart, Lung, and Blood Institute. Morbidity and Mortality: 2009 Chart Book on Cardiovascular, Lung and Blood Disease. 2009. Retrieved from [http://www.nhlbi.nih.gov/resources/docs/2009\\_ChartBook.pdf](http://www.nhlbi.nih.gov/resources/docs/2009_ChartBook.pdf)
- Pate RR, Pratt M, Blair SN, Haskell WL, Macera CA, Bouchard C, et al. Physical activity and public health: A recommendation from the Centers for Disease Control and Prevention and the American College of Sports Medicine. *Journal of the American Medical Association*. 1995; 273:402–407. [PubMed: 7823386]
- Pratt, LA.; Brody, DJ. Depression in the United States household population, 2005–2006. (National Center for Health Statistics No. 7). 2008. Retrieved from <http://www.cdc.gov/nchs/data/databriefs/db07.pdf>
- Radloff LS. The CES-D scale: A self-report depression scale for research in the general population. *Applied Psychological Measurement*. 1977; 1:385–401.
- Ramey SL. Cardiovascular disease risk factors and the perception of general health among male law enforcement officers: Encouraging behavioral change. *American Association of Occupational Health Nurses Journal*. 2003; 51:219–226.
- Ramey SL, Downing NR, Knoblauch A. Developing strategic interventions to reduce cardiovascular disease risk among law enforcement officers: The art and science of data triangulation. *American Association of Occupational Health Nurses Journal*. 2008; 56:54–62.
- Ramey SL, Downing NR, Franke WD. Milwaukee Police Department retirees: Cardiovascular disease risk and morbidity among aging law enforcement officers. *American Association of Occupational Health Nurses Journal*. 2009; 57:448–453.
- Ramey SL, Perkhounkova Y, Downing NR, Culp KR. Relationship of cardiovascular disease to stress and vital exhaustion in an urban, Midwestern police department. *American Association of Occupational Health Nurses Journal*. 2011; 59:221–227.
- Shift work and sleep: Optimizing health, safety, and performance. *Journal of Occupational and Environmental Medicine*. 2011; 53:S1–S10.
- Slaven JE, Mnatsakanova A, Burchfiel CM, Charles LE, Smith LM, Andrew ME, et al. Association of sleep quality with depression in police officers. *International Journal of Emergency Mental Health*. 2012; 13(4):267–278. [PubMed: 22900460]

- U.S. Bureau of Labor Statistics. Employed and unemployed full- and part-time workers by age, sex, race, and Hispanic or Latino ethnicity, 2010. 2011. Retrieved from <http://www.bls.gov/cps/cpsaat8.pdf>
- U.S. Census Bureau. Current Population Survey Design and Methodology. (U.S. Census Bureau, Technical Paper 66). 2006. Retrieved from <http://www.census.gov/prod/2006pubs/tp-66.pdf>
- U.S. Centers for Disease Control and Prevention. Mental illness surveillance among adults in the United States (Morbidity and Mortality Weekly Report, 60(Suppl), 1–29). 2011 Retrieved from <http://www.cdc.gov/mmwr/pdf/other/su6003.pdf>.
- U.S. Department of Health and Human Services. Healthy People 2010: understanding and improving health and objectives for improving health. Washington, DC: Government Printing Office; 2000. Retrieved from <http://www.cdc.gov/nchs/hphome.htm>
- U.S. Department of Health and Human Services. Mental Health: A report of the Surgeon General – Executive Summary. Rockville, MD: U.S. Department of Health and Human Services, Substance Abuse and Mental Health Services Administration, Center for Mental Health Services, National Institutes of Health, National Institute of Mental Health; 1999.
- Vena JE, Violanti JM, Marshall J, Riedler RC. Mortality of a municipal worker cohort: III. Police officers. *American Journal of Industrial Medicine*. 1986; 10:383–397. [PubMed: 3788983]
- Wang Y, Beydoun MA. The obesity epidemic in the United States - Gender, age, socioeconomic, racial/ethnic, and geographic characteristics: A systematic review and meta-regression analysis. *Epidemiology Reviews*. 2007; 29:6–28.
- Wright BR, Barbosa-Leiker C, Hoekstra T. Law enforcement officer versus non-law enforcement officer status as a longitudinal predictor of traditional and emerging cardiovascular risk factors. *Journal of Occupational and Environmental Medicine*. 2011; 53:730–734. [PubMed: 21697738]

**Table 1**

Origin of general population estimates for key comparison characteristics

Variable	Reference Study	Study Population
<b>Demographics and Workplace</b>		
Sex	U.S. Current Population Survey (CPS), 2010	Full-time employed persons age ≥ 20
Race/Ethnicity	U.S. CPS, 2010	Full-time employed persons age ≥ 20
Shift Work	U.S. CPS Supplement, 2004	All employed persons age ≥ 20
<b>Psychosocial Measures</b>		
Depression	National Health and Nutrition Examination Survey (NHANES), 2005–2008	Adults age ≥ 18
<b>Lifestyle Behaviors</b>		
Smoking Status	Multi-Ethnic Study of Atherosclerosis (MESA), 2000–2002	2,801 employed adults age 45–84
Hours of Sleep	National Health Interview Survey, 2004–2007	66,099 employed adults age ≥ 18
<b>Cardio-Metabolic Risk Factors</b>		
Body Mass Index	MESA, 2000–2002	2,801 employed adults age 45–84
Serum Cholesterol Levels	MESA, 2000–2002	2,801 employed adults age 45–84
Hypertension	MESA, 2000–2002	2,801 employed adults age 45–84
Glucose Intolerance	NHANES, 2003–2006	3,423 adults age ≥ 20
Metabolic Syndrome	NHANES, 1999–2004	8,457 employed adults age ≥ 20
Carotid Intima Media Thickness	MESA, 2000–2002	2801 employed adults age 45–84

**Table 2**  
Health disparities between BCOPS Study participants compared to the general U.S. employed population estimates.\*

Variable	BCOPS		General Employed Population Estimate	
	N or %	Mean Age	N or %	Mean Age
<b>Demographics and Workplace Characteristics</b>				
Men, %	73.8 <sup>a</sup>	41.5	-	57.6 <sup>b</sup>
Women, %	26.2 <sup>a</sup>	41.5	-	42.4 <sup>b</sup>
White, %	76.7 <sup>a</sup>	41.5	26.2	81.4 <sup>b</sup>
Black, %	20.3 <sup>a</sup>	41.5	26.2	11.2 <sup>b</sup>
Hispanic **, %	1.8 <sup>a</sup>	41.5	26.2	14.3 <sup>b</sup>
Day Shift, %	53.1 <sup>c</sup>	41.2	28.6	84.0 <sup>d</sup>
Afternoon Shift, %	26.3 <sup>c</sup>	41.2	28.6	3.1 <sup>d</sup>
Night Shift, %	20.6 <sup>c</sup>	41.2	28.6	5.6 <sup>d</sup>
<b>Psychosocial Measures</b>				
Depression, %	12.0 <sup>e</sup>	40.7	27.4	6.8 <sup>f</sup>
<b>Lifestyle Behaviors</b>				
Current Smokers, %	16.7 <sup>a</sup>	41.5	26.2	13.6 <sup>g</sup>
Sleep < 6 hours/24 hour period, %	33.0 <sup>e</sup>	40.7	27.4	8.0 <sup>h</sup>
<b>Cardio-metabolic Risk Factors</b>				
Overweight (BMI 25–29.9 kg/m <sup>2</sup> ), %	41.5 <sup>a</sup>	41.5	26.2	40.0 <sup>g</sup>
Obese (BMI ≥ 30 kg/m <sup>2</sup> ), %	40.5 <sup>a</sup>	41.5	26.2	32.1 <sup>g</sup>
Total Cholesterol, mg/dL	200.8 <sup>i</sup>	41.1	25.9	193.2 <sup>g</sup>
Systolic Blood Pressure, mm Hg	120.9 <sup>i</sup>	41.1	25.9	121.6 <sup>g</sup>
Glucose Intolerance, %	23.6 <sup>a</sup>	41.5	26.2	32.4 <sup>j</sup>
Metabolic Syndrome, %	26.7 <sup>a</sup>	41.5	26.2	18.7 <sup>k</sup>
Carotid Intima Media Thickness, mm	0.62 <sup>i</sup>	41.1	25.9	0.82 <sup>g</sup>

## Data Sources.

- a*: Hartley, 2012;
- b*: U.S. Bureau of Labor Statistics Household Data;
- c*: Ma, 2011;
- d*: McMenamin, 2007;
- e*: Slaven, 2012;
- f*: MMWR, 2011;
- g*: Fujishiro, 2011;
- h*: Luckhaupt, 2010;
- i*: Hartley, 2011;
- j*: Ervin, 2009;
- k*: Davila, 2010

\* The study populations for depression and glucose intolerance were not restricted by employed status.

\*\* Hispanic race or ethnicity. In BCOPS, Hispanic was collected as "Race". In BLS, Hispanic was collected as "Ethnicity". A person could then list "Race" as "White" and also list "Ethnicity" as "Hispanic". As a result, the BLS percentages will not sum to 100 like those for BCOPS.